

REMARKS/ARGUMENTS

Status of Claims and Rejections

Claims 1-18, 20, 22-28, 31-32, and 35-36 are pending after entry of the above amendments. Claims 19, 21, 29-30, and 33-34 have been canceled without prejudice.

Claims 1-5, 8-12, and 28-35 were rejected under 35 U.S.C. 102(b) as being anticipated by JP 2001-355453 to Takemoto.

Claims 1-4, 8-11, 28-29, and 31-35 were rejected under 35 U.S.C. 102(b) as being anticipated by GB 2,162,483 to Senior.

Claims 1-4, 8-11, 28-29, and 31-35 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,324,848 to Gladden et al.

Claims 6-7 and 13-19 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takemoto in view of U.S. Patent No. 6,327,980 to Chen et al.

Claims 20-27 and 36 were indicated to be drawn to patentable subject matter.

Claim Amendments

Applicant appreciates the indication of allowable subject matter in Claims 20-27 and 36. It is submitted, however, that the invention is patentable in broader respects as reflected in the amended claims above. Applicant has amended Claims 1 and 28 to include the recirculation valve in the recirculation line, and a programmed controller that controls opening and closing of the recirculation valve. The programmed controller opens the recirculation valve so as to recirculate compressed air through the recirculation line to the compressor air inlet when the engine is operating below a threshold engine speed, and maintains the recirculation valve closed

so as to prevent recirculation when the engine is operating above said threshold engine speed.

Method Claim 31 has been similarly amended.

Rejections Based on Takemoto (JP 2001-355453)

It is respectfully submitted that Takemoto does not disclose or render obvious the system and method defined by the amended claims. Takemoto discloses a system and method wherein the objective is substantially different from that of the present invention. Takemoto's objective in using the recirculation valve 33 is to replace the conventional turbine bypass valve or "waste gate", in order to avoid over-pressurizing the air at high engine speeds. In a conventional waste-gated turbocharger, the turbine bypass valve is opened at medium to high engine speeds to control the boost pressure to a reasonable level that can be tolerated by the engine without damage. Over-boosting can cause engine damage as well as damage to the compressor as a result of high rotational speed. The basic concept with a waste-gated turbocharger is that a portion of the engine exhaust gas is bypassed to atmosphere so as to reduce the turbine output power and thereby reduce compressor discharge pressure to a reasonable level.

Takemoto accomplishes essentially the same objective in a different way. Instead of employing a turbine bypass valve, Takemoto employs a compressor recirculation valve. When the compressor discharge pressure is above a predetermined threshold, the recirculation valve opens so that some air is recirculated from the compressor discharge back to the compressor inlet. The result is to effectively increase the amount of air flow that the compressor must operate upon, which causes a reduction in boost pressure to prevent an "abnormal rise of pressure" (abstract, last line).

Takemoto's recirculation valve 33 is a simple pressure-actuated valve that responds to the pressure differential across it. Accordingly, it opens when the compressor discharge pressure is at or above the predetermined threshold, and closes when the pressure is below the threshold. This operation occurs regardless of engine speed.

Thus, it is evident that the operation of the system of Takemoto is quite different from that of the present invention as recited in the amended claims. In the claimed invention, the recirculation valve is controlled by control signals from a controller so that the valve is closed at engine speeds above a predetermined threshold, and is controlled to open when engine speed falls below the threshold. Takemoto does not disclose or suggest the claimed invention.

Therefore, Claims 1, 28, and 31 and their dependent claims are patentable over Takemoto.

Rejections Based on Senior (GB 2 163 483)

Senior discloses a supercharger system having a microprocessor-controlled recirculation valve 25 controlled by a programmed microprocessor controller 27. The controller is programmed to control the valve based on engine speed and throttle position of the operator-operable throttle valve 22 (i.e., accelerator pedal position). Senior's objective is to control the pressure of the air-fuel mixture fed to the throttle valve 22 (page 2, lines 47-51). Senior states: "In practice the programme [with which the microprocessor 27 is programmed] would be arranged so that the [boost] pressure would be high when the engine load demand is high and would be low when the engine load is light." (Page 2, lines 51-54.)

High boost pressure is produced by keeping the recirculation valve 25 closed. Thus, Senior contemplates having the recirculation valve closed (so as to achieve higher boost pressure) when engine load demand is high, and opening the valve (so as to reduce boost pressure) when engine load is light. This is not the same as the claimed invention. The claimed invention is aimed at controlling compressor surge, which generally occurs at low engine speeds when a relatively high load is required. To control surge in accordance with the invention, the recirculation valve is controlled to be closed when engine speed is above a predetermined threshold speed, and is opened when engine speed falls below the threshold. Senior does not teach or suggest such a system and method. Additionally, Senior does not disclose a cooling

device as required by the present claims.

Therefore, Claims 1, 28, and 31 and their dependent claims are patentable over Senior.

Rejections Based on Gladden (U.S. Patent No. 6,324,848)

Gladden discloses a turbocharger system having a two-stage compressor driven by a turbine. Each compressor stage has its own bypass duct **48, 50** connected between the outlet and the inlet to the stage, and each bypass duct has a controllable bypass valve **60**. The bypass valves are controlled by a controller **14** that receives various inputs from sensors **16** that sense at least one of engine speed, fuel consumption rate, ambient temperature, air temperature at inlet **36**, air flow through the compressor, temperature in interstage duct **44**, speed of the turbo shaft **24**, engine inlet manifold temperature, engine inlet manifold pressure, etc. Gladden states that the system senses a surge condition with either compressor stage and selectively actuates the bypass valve for that stage to prevent a surge condition.

Gladden thus discloses in a very general way that a compressor bypass valve can be controlled based on sensed conditions. However, Gladden does not remotely suggest the system of Claims 1 or 28 or the method of Claim 31. In addition to failing to disclose an air cooling device for cooling the recirculated air, Gladden fails to disclose a controller that controls a recirculation valve such that the valve is closed when engine speed is above a predetermined threshold and is opened when engine speed falls below the threshold.

Therefore, Claims 1, 28, and 31 and their dependent claims are patentable over Gladden.

Rejections Based on Takemoto and Chen

For the reasons previously noted, Takemoto fails to disclose all of the features of Claim 1 (and fails to disclose an air cleaner as required by Claims 6-7 and 13-19). Chen does not supply all of the features lacking in Takemoto. In particular, Chen fails to disclose a compressor in which a recirculation valve is controlled to be closed when engine speed is above a

predetermined threshold and to be opened when engine speed falls below the threshold. Therefore, even if there were a motivation to combine Takemoto and Chen (which Applicant does not admit to be the case), the combination still would fail to disclose or suggest the invention of Claim 1 and therefore the invention of dependent Claims 6-7 and 13-19. Accordingly, these claims are patentable over the cited references.

Conclusion

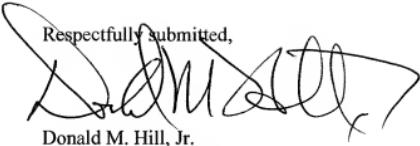
Based on the above remarks, it is respectfully submitted that independent Claims 1, 28, and 31 are patentable over the cited references. Further patentable features are contained in the dependent claims. For instance, the references do not teach or suggest the system and method of Claims 35 and 36 wherein the degree of recirculation valve opening RVO is controlled as a function of engine speed and compressor outlet pressure. Additionally, the references do not teach or suggest the system of Claims 5-7, 11-13, 23-27, and 28, having a mixing device connected to the recirculation line and the compressor inlet line and operable for mixing cooled, recirculated air from the recirculation line with inlet air from the compressor inlet line.

Based on the amendments and remarks presented above, it is submitted that all pending claims are patentable and the application is in condition for allowance.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefor (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

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